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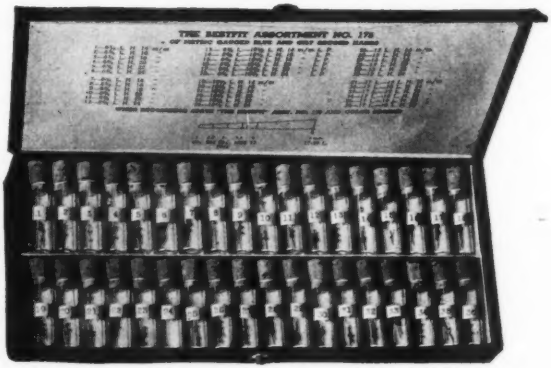

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Swartchild's New ROSE Gold Filled

(Pink)

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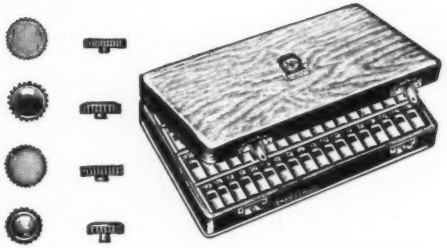

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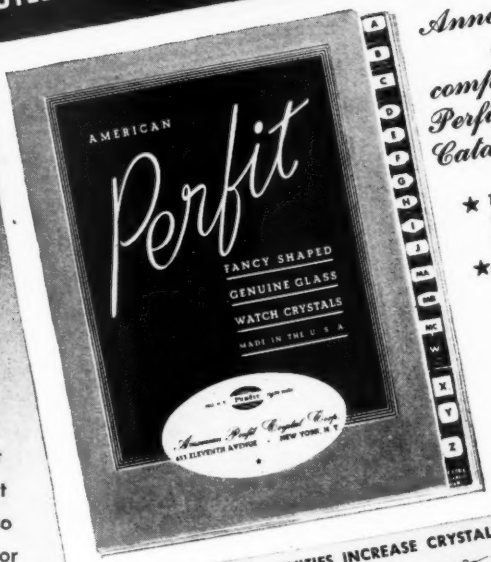

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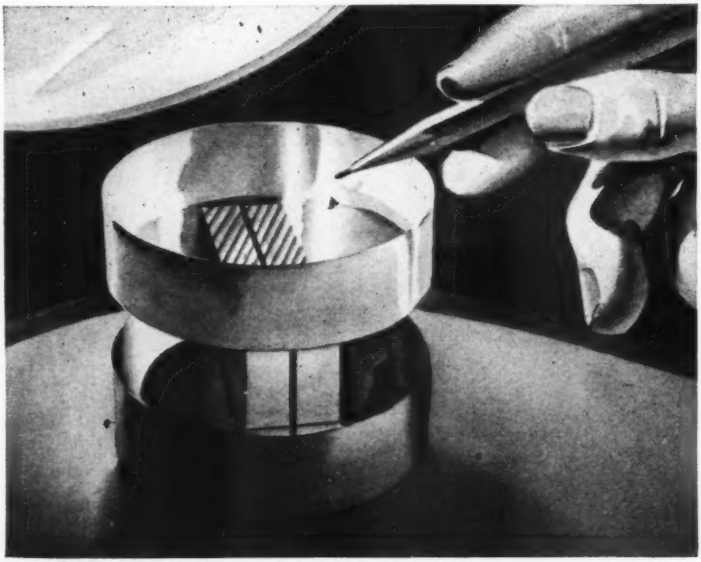

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A New Development In Watch Lubrication

By GEORGE E. BAKER*
and FRANK D. URIE**

Presented at
UNITED HOROLOGICAL ASSN. OF AMERICA, Convention Duluth, Minn. and H. I. A. Annual meeting, Washington, D. C.

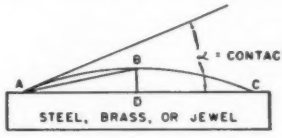
**Industrial Fellow, Mellon Institute, Pittsburgh, Pa.*
***Superintendent of Research and Inspection, Elgin National Watch Company.*

I. INTRODUCTION

A. Historical

The problem of oiling watches is probably as old as the watch industry itself. A variety of vegetable, animal, and marine oils have been employed as lubricants for timepieces and other small and precise mechanisms. Also, blends of these oils with mineral oil have been used quite extensively. The lubricant that has probably enjoyed the widest application to horological work is that prepared by rendering the fats from the jaw of the porpoise. In recent years synthetic oils have appeared on the market. Some of these lubricants consist of mixtures of organic chemicals used as plasticizers in the lacquer and resin industries.

CONTACT ANGLE MEASUREMENTS



IF THE DROPS ARE SMALL THEIR SURFACES WILL BE PORTIONS OF SPHERES. THEN, $\alpha = 2\frac{BAD}{}$.

$\overline{AD}$ AND $\overline{BD}$ ARE MEASURED WITH A MICROMETER EYEPIECE, AND $\alpha = 2\ TAN^{-1}\frac{BD}{AD}$

Figure 1

B. Analysis of the Problem

The present study of lubrication as specifically applied to watches and fine mechanisms was commenced with a critical survey of the properties believed indispensable to the ideal watch oil. Our exhaustive analysis of the problem indicated that the lubricant itself should not spreaad on the jewel and metal surfaces with which it comes into contact. The lubricant must not be corrosive nor become corrosive during the period of use. Since these oils are exposed to air for extended periods of time, they must not oxidize, become rancid, or form gum under ordinary atmospheric conditions or in the presence of the parts to which they are applied; and in genral they must retain chemical stability over a period of years. It is also essential that a lubricant to be used for such a purpose should possess a vanishingly small volattility within the normal operating range of temperatures, and a low temperature of solidification. Furthermore, it is desirable that the lubricant have a relatively low viscosity which should be as nearly independent of temperature as possible. Since shellac is commonly used in watches in cementing some of the jewels, the oil must neither dissolve nor attack this natural resin. On the basis of an estimation of the approximate bearing pressures for an average sized balance, it was evident that a satisfactory lubricant must possess good boundary lubricating properties, as explained in the following section.

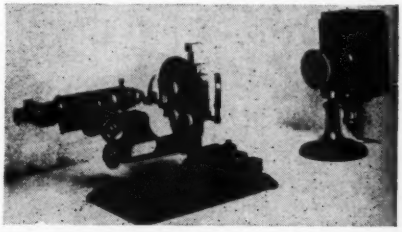


Fig. 2—Microscope for Contact Angle Measurements

C. Theory of Lubrication

According to currently accepted

views, lubrication is divided into two classes:

1. Viscous Lubrication
2. Boundary Lubrication.

If the moving and stationary surfaces of a bearing at their point of nearest approach are still separated by a distance equal to several thousands of times greater than molecular dimensions, viscous lubrication results. This condition existss in the presence of relatively high speeds and low bearing pressures; the frictional forces developed under these circumstances are a function only of the viscosity of the lubricant. The mathematical laws governing viscous lubrication were first formulated by Reynolds.

Boundary lubrication results when the bearing surfaces are separated by a layer of lubricant only one or a few molecules in thickness. This condition is present when the speeds are low or the motion is intermittent, and the bearing pressures are relatively high. In this type of lubrication the frictional forces are practically independent of the viscosity of the lubricant and are a function of its chemical structure and the nature of the bearing surfaces.

It is probable that both viscous and boundary lubricating conditions exist in watches. The latter are encountered, for example, wherever the bearing pressures are very high, as in the balance wheel jewels. Hence the ideal watch oil must have properties embodying both types of lubrication.

II. DEVELOPMENT OF LABORATORY TESTING PROCEDURES

After deciding upon the required characteristcis for optimum watch lubrication, it was necessary to devise rapid and reliable procedures for determining these properties.

A. Spreading

The best method of evaluating quantitatively the tendency of a liquid to spread on a solid surface is to measure the angle of contact which the liquid makes with the solid. The most desirable procedure for the present problem is the measurement of the dimensions of a sessile drop on the surface in queston, a condition that resembles that encountered in a watch. The dimensions of the drop are determined by means of a low power microscope equipped with a filar micrometer eyepiece. In order to insure the use of liquid drops of reasonably uniform volume, it was necessary to construct a special microburette capable of delivering liquids with a maximum error of 2 per cent. In practice, drops containing 0.000183 cubic centimmeter were employed, since distortion of shape due to gravity is eliminated to a great extent by the use of a very small volume.

The correlation between the spreading tendency as predicted from contact angle measurements and the actual observation of watches is remarkably good.

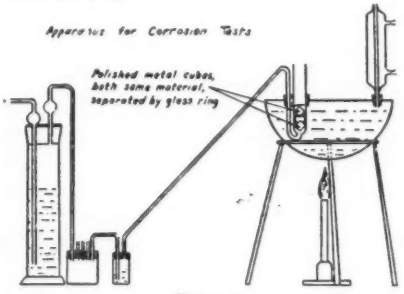


Figure 3

B. Corrosion

Because of the necessity of absolute non-corrosiveness in watch oils, it was necessary to devise accelerated corrosive tests. A quantitative procedure was developed in which carefully prepared steel and brass specimens are immersed in the oil while moist air is continuously introduced, and samples being maintained at 212°F for 120 hours. The loss in weight of the metal specimens is a measure of the extent of corrosion. Microscopic examination of the test samples reveals any incipient corrosion on the surface.

A second corrosion test that was

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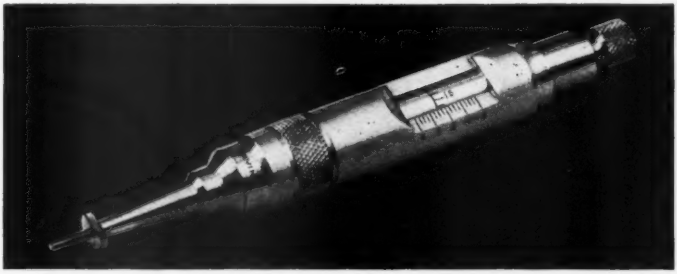

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employed involves the observation of watch pivots oiled with the lubricants and placed in a humid atmosphere maintained on alternate weeks at 212° F. and at room temperature.

C. Viscosity

The viscosity of watch oils can be determined with any of the standard types of viscometers. In this work it was found convenient, when only a small sample was available, to use the capillary tube viscometer described by Lidstone. This instrument is easy to construct, simple to operate, and sufficiently accurate for practical purposes. A one cubic centimeter sample of oil is adequate for the determination.

D. Volatility

It is extremely difficult to measure the volatility of oils under conditions at all comparable to those existing in a watch. The method employed consists of blowing a measured quantity of dry, clean air through Liebig absorption bulbs in a thermostat, but the results are reliable only for controlled comparisons.

E. Boundary Lubricating Quality

It was stated earlier that most certainly boundary lubricating conditions exist in a watch, and consequently an ideal watch oil must have what may be called "oilness". In order to measure this property of oili-

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ness, an instrument was designed employing the oscillating motion of a pendulum, which is similar to that of the balance wheel of a watch; the period was so adjusted as to produce the same maximum relative speed of the bearing surfaces as the maximum speed of the balance pivot of a watch. The bearing surfaces consisted of a steel ball on plane sapphires, and the pressure was made the same order of magnitude as that computed to exist in the balance pivot of a typical watch by the choice of the weight of the pendulum and the diameter of the steel ball. The correlation between the coefficient of friction as measured by this instrument and the motion of the balance wheel of a watch is almost perfect and hence the

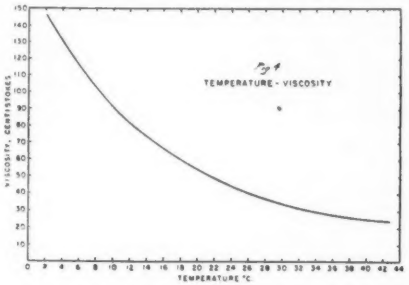

Figure 4

method has been of great value in solving the watch oil problem.

III. SOLUTION OF THE PROBLEM

When satisfactory laboratory testing methods had thus been established for determining the requisite characteristics of an ideal watch oil, it was necessary to correlate these properties with the organic chemical structure of the lubricants. The general relationship of the chemical structure to some properties was already known, as, for example, in regard to viscosity, corrosiveness, volatility, and, to a limited extent, oiliness.

The contact angles of approximately two hundred substances were measured on glass, brass, steel, and

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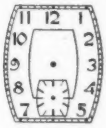

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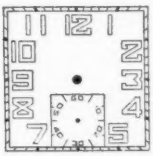

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ruby surfaces. The assembly and critical analysis of these data made possible the formulation of a theory that permitted the prediction of the spreading characteristics of an organic chemical compound of known structure.

"Oiliness" which is discussed here is that property of a lubricant which is measured by the coefficient of friction determined with the dynamic lubricant testing instrument described in an earlier section of this paper. High molecular weight fatty acids such as oleic and stearic are excellent oiliness carriers, and their addition to mineral oil in small quantities is known to effect great improvement in the oiliness of the latter, though of course the other properties are not affected in the right direction to render these materials suitable for our purpose. Also, esters of fatty acids, particularly esters of hydroxy fatty acids, e. g., castor oil, are good boundary lubricants. Since these substances are corrosive themselves or tend to become corrosive during use, they are unsatisfactory for watch oils. Therefore, it was essential to extend our knowledge of the relation of oiliness to chemical structure in order to obtain satisfactory materials. The required non-corrosive boundary lubricants were discovered.

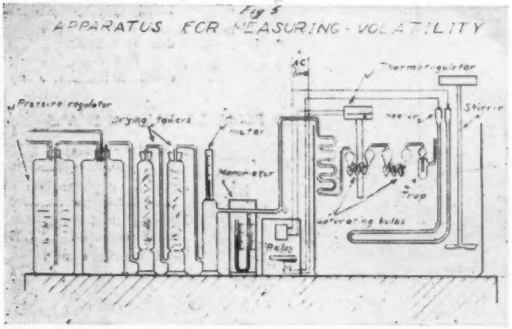

Figure 5

After examining a large number of commercially available materials, it became apparent that the only possibility of obtaining an oil which even approached an ideal watch lubricant was through synthesis. Since the effect of chemical structure on the numerous properties desired in a watch oil was known, it was possible to predict in a general way the types of compounds necessary to obtain the desired results. Because of the multiplicity of definite properties, it was necessary to synthesize a large number of compounds. Each new oil approached more closely the ideal combination of characteristics until finally very satisfactory materials have been obtained. Consequently, the products now in use are entirely new materials with a new combination of properties which had never before been realized.

Table I records the properties of the best watch oil developed during this research together with some previously available. Examination of the table reveals the combined superior properties of high contact angles, low solidification temperature, high viscosity index, non-corrosiveness, and low coefficient of friction possessed by the specimen of the new lubricant.

IV. FACTORY TESTS

In addition to the laboratory work carried on at the Mellon Institute, an elaborate procedure was set up at Elgin in order to test the lubricants for actual running condition in watches. The first test consisted of oiling a number of small ladies wrist watches, 21/0 size, with each new lubricant as it was received. These watches were wound daily and the motions of the balance wheel were read at weekly intervals. Periodically they were examined with a microscope to determine how much, if any lubricant remained in the bearing. The results of such a test on the new

lubricant are shown graphically in the chart. The vertical coordinate indicates the average motion of the watch and the horizontal coordinate the length of the test in days (420). Two horizontal limiting lines were set arbitrarily at slightly more than 1½ turns as the maximum desirable motion and 1-1/8 turns as the minimum motion, below which point the performance was considered unsatisfactory. The average motion readings are represented on the graph by circles which are connected by solid lines. The dotted line portion near the middle of the graph indicates the period of 31 days during which the watches were allowed to run down in order to determine recovery of motion. It will be noted that at the end

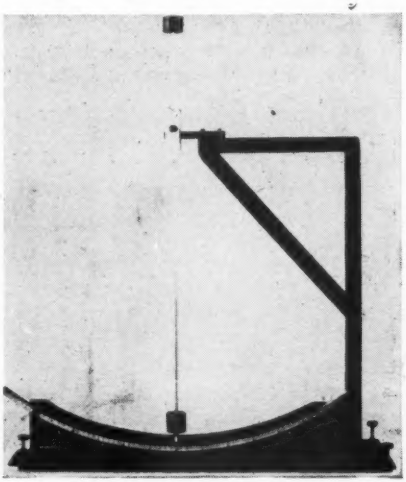

Figure 6—Oiliness Tester

of the curve covering a period of 420 days from the start, motions of these watches are very satisfactory. This test is still in progress and will be continued until such time as the motions drop below the minimum requirements. By way of contrast, we have included on this chart another curve of a similar test conducted with a lubricant not our own, but advertised as "suitable for watches." In the case of this lubricant the average

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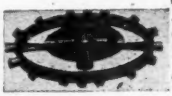
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motion dropped below the minimum requirements in 7 days. At the end of 15 days 60% of the watches under test had actually stopped.

If the performance of a given lubricant appeared to be good in the test described above, 100 watches were oiled with it and the watches were allowed to go through the factory in the regular manner. This sampling process was extended to lots of 1,000 watches, then to 5,000 watches, and in the case of the new lubricant the final sample lot included 50,000 watches, before this product was adopted for use on all Elgin watches.

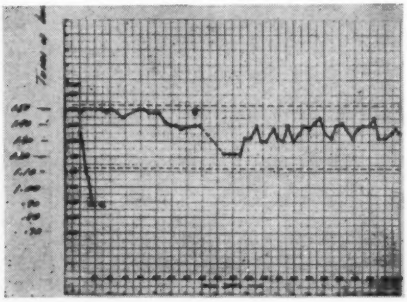

Figure 7—Comparison of balance motion, oiled with new lubricant and with another watch oil.

A great many other types of tests were made, a full description of which would require more time than can be allotted to this paper. A particularly interesting one, however, is illustrated in the following chart. the purpose of this type of test is to investigate the effect of various oils on the performance of watches at various temperatures. For this test the same ten Elgin 16 size pocket watches were used in all cases, the only difference being in the lubricant employed. These watches were run in th dial-up position and the mean daily rates were determined at each of the following temperatures: +120 F., +95 F., +70 F., +40 F., +20 F., 0 F. and -20 F.

At each of the above temperatures the motions of the balance wheel were read at the end of each 24 hour period. The figure shows graphically the results of such a test with two different lubricants, the solid line for the new lubricant and the dotted line for another watch oil. It can be seen from the temperature-rate curve that the watches when oiled with this new Elgin lubricant performed very satisfactorily at all temperatures between 120 and +20 F. However, when these same watches were lubricated with another oil, the temperature-rate curve was not nearly so straight; furthermore, the watches would not run at temperatures below zero. This difficulty is due mainly to a drop in motion, as shown from a study of the temperature - motion curves given at the right of the slide. Here we see that when the watches were lubricated with the other oil the motions dropped off rapidly as the temperature decreased. This test shows that to obtain satisfactory performance at low temperatures, a suitable lubricant is just as essential as close compensation of the hairspring and balance. It also shows that the actual shape of the temperature-rate curve is influenced considerably by the type of oil used in the watch.

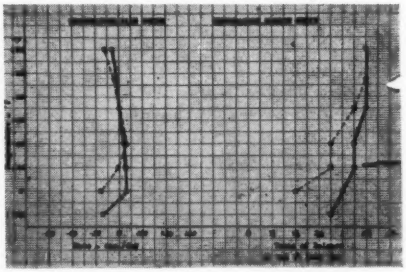

Figure 8—Temperature-Rate and Temperature-Motion curves for new lubricant compared with those of another watch oil.

V. CONCLUSION

This research has produced a new lubricant which does not spread on the steel, brass, or jewel surfaces of a watch. It has satisfactory lubricating properties, is resistant to oxidation, does not corrode, and possesses a low rate of evaporation. It also exhibits a high viscosity index and low

pour and solidification temperatures. The new lubricant is recommended for use in various types of precise mechanisms for which an oil with the properties described is required.

The successful solution of this problem of watch lubrication was attained through the combination of fundamental scientific investigation and practical evaluation of the products of the laboratory by experts in

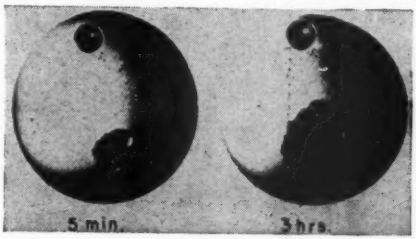

Figure 9—Spreading of watch oil on steel. Same volume of oil in each drop.

the industry at each step of the investigation. Such close and harmonious cooperation between theory and practice is an essential aspect of a sound research program. The result is a striking example of the application of basic scientific procedures to the problems of watch technology.

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TABLE I
Comparison of Watch Oil Properties

Lubricant	Contact Angles Brass	Steel	Ruby	Solidification Temperature °F.	(Centistokes) Viscosity 40 °F	90 °F	Corrosion Brass	Steel	Pivot Watch	Friction Coefficient On Sapphire
Oil A	Low	Low	High	−25	162	42	No	No	No	0.0982
Oil B	Low	Low	Low	−20	87	26	Yes	No	Yes	0.1013
Oil C	High	Low	Low	−20	310	45	No	No	Yes	0.1039
Oil D	Medium	Medium	High	−50	69	18	Yes	No	Yes	0.1138
New Elgin Lubricant	High	High	High	−50	160	32	No	No	No	0.1000

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The illustration shows a Hamilton technician checking the taper of the long end pivot of a center pinion. Some of the other uses for the Profile Projector are: (1) Checking the shape of pinion leaves and wheel teeth (2) Checking the shape and size of balance staff cones and pivots (3) Checking the shape and pitch of tap and screw threads (4) Checking the curvature of hole jewels or the impulse face angle of a pallet stone.

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(Editor's Note): This column will be devoted to "practical bench ideas," under the sponsorship of Herman R. Pedrick, member of the Technical Board of the U.H.A.A.

You are urged to send in your ideas to the publication, regardless of what your little bench quirks may be. Let's have them—they may help the other fellow.

A successful and positive method of testing balance staff pivots. Using a thin screw head file, and it is advisable to grind it as thin as possible to a v shape, with this file put two v shape notches in the metal of the parallel jaws of your poising tool.

The pivots should rest on the sides of the v and be careful do not make a u shape slot, as the pivots will rock back and forth making it difficult to determine their condition. Start the balance wheel rotating with your hand blower and look at the pivots with your ½ inch or 18 power or better yet an inexpensive student's microscope which can be purchased for a few dollars. With this method you will discover bent, oval, burred and worn pivots.

Doing A Good Job

By JOHN DE VOGEL

Fellow craftsmen, in these times, when every ounce of energy is being concentrated on National Defense, I believe that as a National Association, our most helpful course of action is to keep on doing old familiar tasks to the best of our ability.

Each National member in this great Association of ours should do his bit, as part of the total job being done and borne by America's brawny shoulders.

We continue to offer the best possible aids and the largest available Educational services to all affiliates and its members within our craft, who look to us for the most advantageous way to convert organization interest into human needs, and likewise which invigorate self-assurance and endow routine living with a wholesome, essential sense of fulfillment.

Help boost the Technical Schools and Colleges of Horology, accredited by our National Association, to those young men and women who seek to follow our vocation.

Each day, as we learn that the National Defense program is going great guns—we're sentimental enough to admit to a glow of patriotic pride, because as one of the country's leading associations we're doing our job the best way we know how, by serving you the watchmakers and the public of our country, who, in some way or other, are building not only that defense, but establishing a greater United Horological Association of America for us all, in our time, and for all future generations of American Horologists.

As the possibility of shortage looms, jewelry manufacturers go on trial. It is their job to keep the jeweler supplied, of course, but the merchandise must be in keeping with the jeweler's prestige in his community. ★ Now, as always, Kreisler brooks no compromise with the quality for which you stand. ★ And Kreisler looks forward to keeping you adequately stocked not only with watchbands but also with a comprehensive line of men's and women's jewelry that has made Kreisler a buy-word with your gift-minded customers. ★ Keep your quality up . . . with jeweler's-quality jewelry by Kreisler. Keep your stock up . . . with advance orders.

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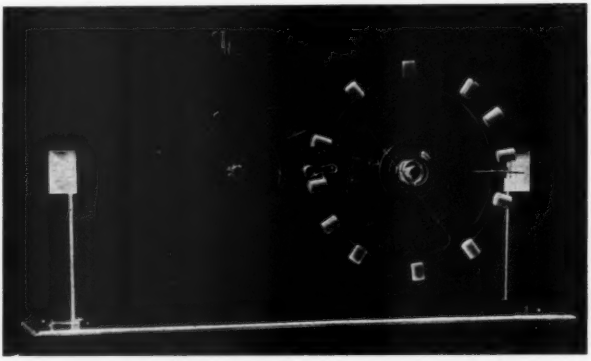
The accompanying photo of Plastic working model was made by O. R. Hagans and won first place for unusual creation and workmanship. This model is made of Lucite Plastic (transparent) except for the balance screws and jewels which are Catalin Plastic and not transparent. The hairspring is of piano wire, the power is specially built using an old tork clock spring, power is delivered to the fourth wheel, all moving parts are on toolsteel rods, and ball bearings, the bearings being imbedded in the plastic.

The base is of walnut and houses a fluorescent green light which gives a piercing light through the model making it look skeletonized. To secure this effect never polish the cut edges of plastic. On this model no filing was done.



Those interested in making a model this size which is three feet in length, may secure the layout drawings from the American Horologist at $3.00 per set.

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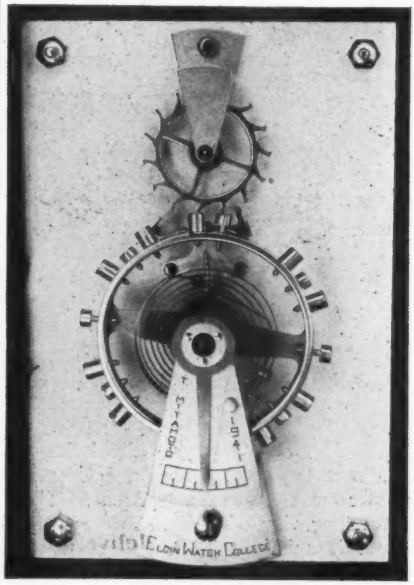
Second Prize, National Workmanship Competition U. H. A. of A.

The above model was made by Mr. Tadami Miyamoto, of Honolulu, T. H. Mr. Miyamoto was practicing watchmaking in Honolulu, took the



H. I. A. Junior examination in 1939, won a scholarship, and selected Elgin for his training. He has now been with Elgin for a year, and has proven himself to be an exceptionally fine mechanic. Besides building the escapement model, he built a very fine filing attachment for his lathe and many small tools, including a pivot polisher.

He is now taking a course in Gemology and then will return to Hawaii, to engage in business.

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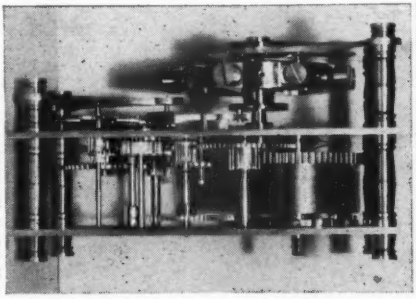
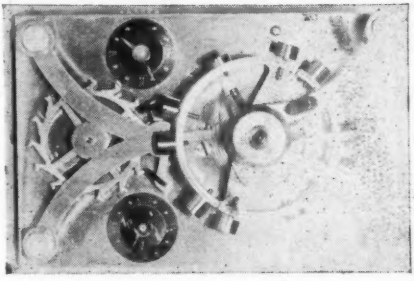
First Prize, National Workmanship Competition U. H. A. of A.





The above photograph is of the first prize, Escapement Model, which was entered by Stanley Prokop of Rushville, Nebraska.

Mr. Prokop operates an exclusive clock repair and replacement shop. He was a student of the Elgin Watchmakers College, but his model was made in his own shop in Rushville.

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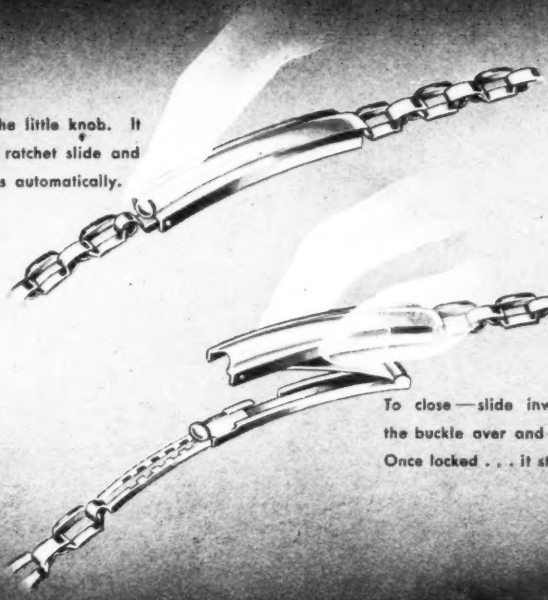

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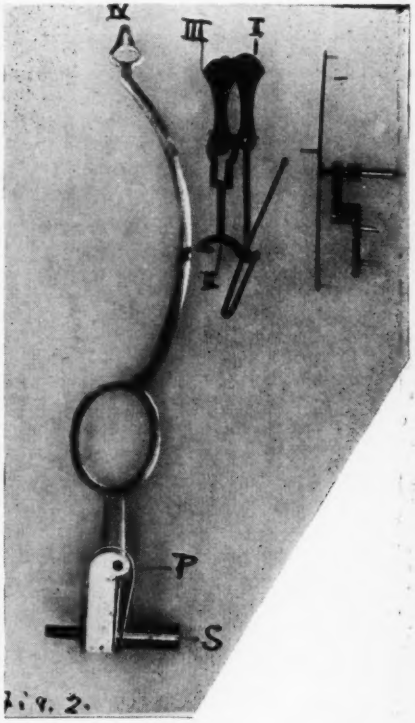
A Mystery Clock

By W. BARCLAY STEPHENS, M. D.

An element of mystery usually adds spice to a subject and piques one's curiosity.

In this clock the mystery is not alone in the operation of the free pendulum, but also as to who was the maker. The first mystery is easily solved by taking the movement from its case; but not so the second, for the maker was not so thoughtful as to place his name upon the movement. And, furthermore, a careful search and many inquiries have failed to reveal his name.

The only mention I have been able to find of this clock is in the British Horological Journal of October, 1878, wherein the presence of one of these clocks at the Paris Exposition in 1878 was noted and its method of operation very briefly commented upon. The fact was also cited that the clock had been before the public for about six years. An award of a gold medal was given the clock, presumably at this Exposition.



I have knowledge of only three of these clocks beside this one of mine. One is in Texas, one in England, and one in San Francisco. The general design of all four is the same. The cases are of black marble and are surmounted by the figure of the huntress, Diana, with the "free pendulum", suspended from her upheld right hand her bow and game in the left. The one here described is 24 inches high, whereas the other three are 30 inches. This one differs also in having a dial of plate glass instead of an opaque one, thus giving a view of one of the most interesting and fascinating features of the clock, viz.,

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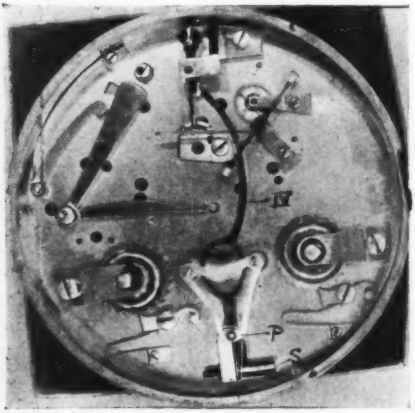
the escapement. As you watch the action of the escapement, you are reminded of the name "grass hopper" which was applied to John Harrison's chronometer escapement.

The case of the clock is of the character which was popular in the decade of 1870-1880.

The photograph, Fig. 1, gives a good conception of the general appearance of the clock. The figure supporting the pendulum stands upon a glass disc which in turn rests upon a table top.



As the vibrating pendulum is watched, there is no apparent connection between it and the clock work which operates it and which it, in turn, controls.

The movement does not differ in any material way from an ordinary French movement until the arbor which commonly carries the escape wheel is reached. The escape wheel in this clock is replaced by a delicate bar, fitting friction tight at its center over the escape arbor. At each end of this bar is a pin which projects backward; and three millimeters from its center is a third pin which projects forward. On this forward projecting pin pivots another delicate bar which is the connecting link or yoke between the escape wheel bar and the rest of the escapement assembly located on the left side of the clock. This assembly, excluding the yoke, is composed of four members placed one in front of the other in the order, I, II, III, IV. Fig. 2.

With a space between, parts I and III are fixed upon a staff and are thus in effect one piece. At each end of this staff is a pivot, the one fitting into the front plate of this movement and other into a supporting bridge or cock. A staff with

pivots at each end and planted between the upper ends of I and III carries part II. This piece has a keyhole shaped opening which fits loosely over the staff of I and II. Just above this hole is fixed a pin which projects backward through a slot in III. The lower end of II is divided into two arms which bend forward at right angles to form two pallets.

Number IV lies behind the other three and next to the front plate. At its upper end is an inverted keyhole shaped opening. The rounded portion of the opening fits loosely over the elongated back pivot of the staff of

I and III. The slotted portion of the opening receives the end of the pin which projects backward from II. For the purpose of keeping it in line, or parallel, the left hand end of the yoke is curved back on to itself and fitted over the pivot. The other end pivots on the slightly off center pin of the "escape bar."

As the escape arbor revolves (clockwise), it carries with it the escape bar and excentric pin gives a to and fro motion to the yoke. This motion is in turn transmitted to I and III, and thence to II, thus placing the pallets of II in position for the pins at the ends of the escape bar to lock alternately upon the lower surfaces of the pallets. The backward projecting pin in II engaging in the slot in the upper end of IV gives it a to and fro movement. Since IV is pivoted at P, Fig. 3, not far from its lower end, the lower arm of the lever is shorter than the upper and the range of movement proportionately less than that above.

At the lower end of IV is a box like affair with an opening at the back, regulated in its width by the screw S. This opening receives a small knob on the end of a horizontal tapered rod, which at its other larger end is joined to a heavy round vertical pillar, Fig. 4. This pillar is conical at its lower end for a bearing and has on its upper end the table top, upon which rests the glass disk supporting Diana. This completes the circuit and brings us back to the "free pendulum", and there remains only to trace the operation.

A to and fro motion is transmitted by the eccentric pin of the escape bar through the yoke to I and II and thence to III, and through the medium of the backward projecting pin on II to the upper end of IV, and thence to its lower extremity, but in a lesser arc of motion, which swing is in turn imparted to the horizontal rod. Since this rod is 7.5 centimeters long, the movement transmitted through the pillar to the table top and thence to standing figure of Diana is not perceptible to the eye, and yet is sufficient to actuate the pendulum.

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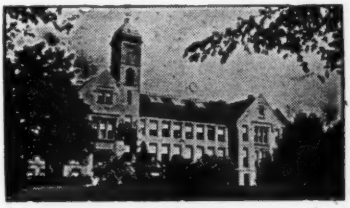

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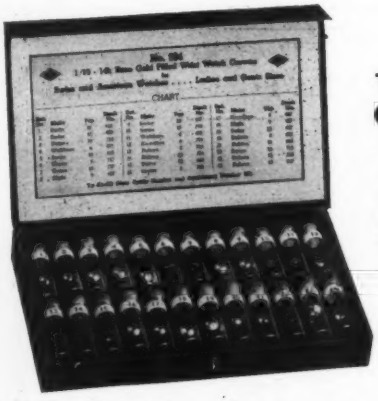

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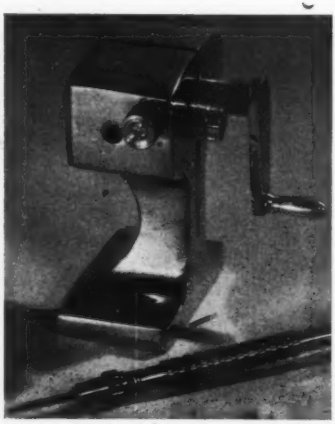

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Associations Abroad

By M. G. BENITEZ, *Dean*
Standard Watchmaking Inst., N. Y.
at UHAA Annual Convention, Duluth

Analyzing the horological situation throughout the entire world, we find that it is not only in these United States, but in other countries as well, that the Watchmaker is fighting against great odds to achieve due recognition for his profession. Horologists everywhere have come to the realization that only by uniting their efforts under the banner of a great organization can they win this desired recognition.

I have chosen to speak to you on some of the accomplishments of the National Federation of Jewelers—Watchmakers and Silversmiths of Spain. This Federation, which was started many years ago, is an institution very similar to our National Association, except that under its banner are grouped the wholesale and retail jeweler, the watchmaker and the silversmith, as well as the engraver and the stone-setter. This combination makes it one of the strongest associations of its kind. It represents the complete interests of the entire jewelry and watch industries. This Federation has succeeded in establishing a code of ethics that has reduced to a minimum price cutting, fake actions and other unfair practices. It is not difficult to see the possibility of this when both the wholesaler and the retailer belong to the same association. Those who dare to violate this strict code of ethics find themselves criticized from all sides and publicly rebuked by the official magazine published by the Federation.

Another important feature of the Federation is the system of identification cards. These cards are issued to all the members and without them it is very difficult to purchase or obtain watch parts and supplies. The reason for this is that the material dealer, who is in reality the wholesale jeweler, as a member of the Federation does not wish to be subjected to criticism by selling to those who do not possess these identification cards.

Then too, there is the social and human aspect of the Federation. The Federation is divided into local groups which are situated in the more important cities. The members of these groups hold their meetings and social affairs in the local "Centros" and receive the benefits of the "Quintas". "Centros" are buildings equipped with all the facilities for business and social events. There we find libraries and other important features intended to create and instill an enthusiasm for the advancements of the profession. The "Quintas" are clinics and hospitals where members receive free medical care and attention. By the means afforded by these "Centros" and "Quintas", the members of the National Federation not only have an opportunity to develop and advance their profession, but are also enabled to progress socially.

Through this method of organization, the Federation not only sees to it that the business interests of the horologists are protected and that the members receive the opportunities for education and relaxation, which you know are so vitally important in such a profession as ours, but in addition, they receive sick and death benefits. Truly, this is a splendid example of modern progress and perfect social service so necessary in every profession in our own day.

Our own organization in the U. S. has existed seven years. In this comparatively short time, it has done an excellent job of protecting the interests of the horologist through sound propaganda and by making a success of all the enterprises it has undertaken.

Gentlemen:—it is our earnest hope here today, at this convention, that this organization will not stop at the business interests, but through its sustained efforts and perfect organ-

ization will make in the near future a reality of the ideal of social service such as I have been speaking about. Nothing, I am sure, could tend more to the advancement of our profession in these United States than the realization of this social action in our Association.

Southern California Inventor Devises Unique Clock To Aid Aerial Navigation

By LUCIUS S. FLINT

A unique chronometer which will shorten the training period required for turning out first-class aerial navigators was recently exhibited in Los Angeles by Maurice Poirier, an instrument maker for a Burbank, Calif. aircraft company.

Distressed over the complex book and paper work connected with the navigation of long-range bombers, Poirier invented an arc and time clock which simplifies the plotting of courses. The California inventor explains that with the new equipment a navigator can determine the Greenwich hour angle of the sun as well as the local hour angle by reading the clock dial. He doesn't have to look up mathematical tables and go into elaborate calculations as has been the case in past years, Poirier points out.

The aircraft worker's chronometer is an amazing sturdy piece. He now has one of the clocks which has withstood bombings and submarine warfare in England and the North Atlantic and was returned in running order.

The instrument is about the size of a large alarm clock but has several dials and hands and a half-circle vernier at the top. The clock shows Greenwich civil time and local time, as related to the corresponding hour angle of the sun. On the new equipment, the vernier records the minutes and seconds with the corresponding conversion of arcs when the celestial observation is made to find the position of a plane or a ship at sea.

Throwing precedence to the winds, the Southern California inventor succeeded in designing a second hand that can be set to a radio time signal without interferring with the operation of the clock itself. Of course in the ordinary clock or watch, the fine-meshed gears of a second hand would break if the indicator were turned manually like the minute hand while the timepiece is running. With the aid of a secret design, Poirier overcame this difficulty.

Incidentally, this chronometer is designed to be carried by the navigator, with his bubble sextant, rather than being installed on each ship or plane. Relatively small size makes this entirely practical.

Merrimack Valley Horological Guild No. 6

Held their first annual outing July 27, at Howards Grove, Derry, N. H. We started for Canobie Lake where we enjoyed the amusements and also the roller skating. The children and the ladies enjoyed swimming as well as the amusements. We had races for for the children, in which prizes were distributed. A horse shoe contest was held in which Mr. and Mrs. Roy Hoelzel were declared the winner after a strenuous battle with other contestants of the guild. The attendance was about 75 in all. The members and their families brought their own lunch basket. Refreshments were free.

The committee for the outing consisted of: President, W. Upton, Vice-President, J. Caten A. Knowlton, Treasurer, Ray A. Ricard, Secretary, E. Belley, T. Campbell, G. Penn, R. Hoelzel.

Ray A. Ricard, Sec'y.

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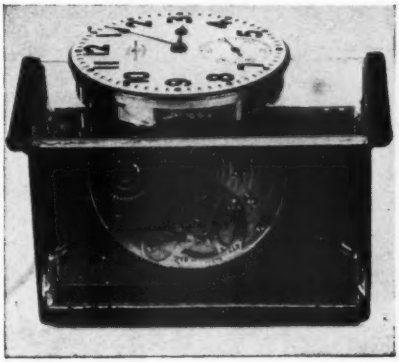
Hot Springs Horological Association

Organized and elected officers. The officers for the ensuing year are:
President—Tom Burns
Vice-Pres.—O. H. Gholston
Secy-Treas.—Earl Baird
National Trustee—not as yet elected
Directors: H. E. Bridges, B. F. Steadman, Chas. Harrington, Jim Hamel. All are of Hot Springs, Arkansas.

See Them From the Bottom



—Photo by L. Levin

When repairing watches one can seldom expect good performance unless the motion of the balance is nearly equal in both flat positions. Jes I. Hansen comes to the assistance of the horologist with a simple device which makes it easy to observe the motion of the balance in the dial up position. It consists of a stand in which a mirror is mounted at a 45 degree angle and provided with a plain glass top on which the movement is placed. Thus, one can sit in a natural position and without twisting his head observe the motion of the balance.

One of the French horological publications, La France Horlogere, which formerly was published in Paris, is now being issued again in the unoccupied zone.

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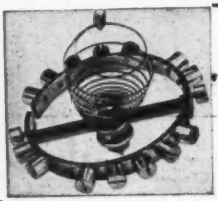

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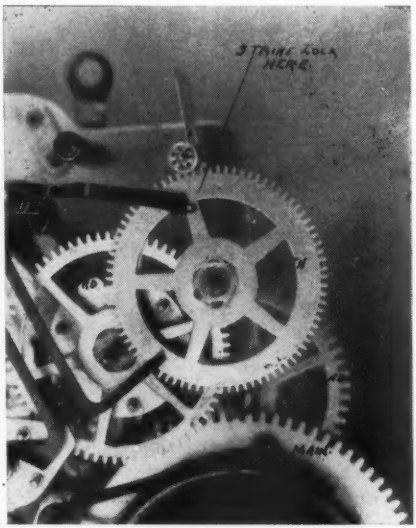
National Clockmakers Examination, Question No. 101

By J. E. COLEMAN

101. "How much run or freedom must the warning wheel have from the time the stop lever releases the warning wheel until the trip lever engages the pin in the warning wheel in the striking mechanism?"

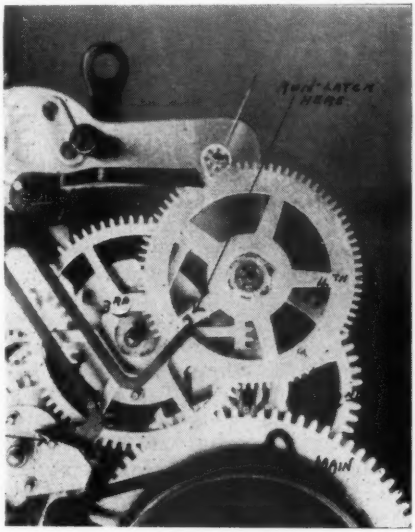
Answer:

101. "In the ordinary clock, the warning wheel should have one and one-half revolutions of freedom run between stop lever and trip lever."



The two photos, this happens to be a current Seth Thomas, most clocks, that is practically all American and lots of the foreign clocks have their strike trains constructed upon about this same principal; i.e. the lock pin and the run-latch pin are one and the same, and therefore located in the same wheel. Now it is a mechanical impossibility to have this pin slide off the locking position, make a revolution and a half, then catch on the run-latch. The strike mechanism must be so adjusted that when the center lift

has raised the strike lock high enough to allow the lock pin to slide off, the run latch too has already raised high enough to catch the pin as it comes around. In the case of these illustrations, about one-fourth revolution.



The condition brought to mind by the answer above, indicates some fine french clocks, and, some imported chime clocks, which have two (2) pins to form this function—the lock pin being located in one wheel and the run-latch pin in another wheel of the strike train; in which cases it is quite possible and proper to have a revolution and a half run-freedom.

My answer to question 101 as it is above stated would be: "The amount of freedom-run depends upon the construction of the strike train. In these trains where the strike lock and the run latch are accomplished by ONE pin, the amount of freedom-run is the distance from the lock lever to the run-latch lever as built in by the factory—usually from one fourth to one half revolution. In trains where TWO pins are utilized, the train should be set up to allow about a revolution and a half of the wheel carrying the lock pin before the run-latch pin comes to rest on the run-latch lever."

Central Missouri Horological Guild

At the closing meeting of the season, June 19, new officers were elected for the ensuing year.

Mr. A. R. Jones was elected president; Frank Lamb, vice-president; Clinton Holt, secretary, Claude West, treasurer.

The balance of the evening was spent in discussions on escapement drawings prepared by the secretary.

A jeweler has invented a device for use in sleeping cars that promises to be popular. It is a ladder composed of tubes of leather that provides easy access to upper berths.

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Demands For Skilled Watchmakers

By GEORGE T. GRUEN

U. H. A. A. Seventh Annual Convention
Duluth, Minnesota, June 22-24, 1941

There is always a demand for skilled watchmakers who have had good training. By good training is meant having learned the trade through apprenticeship with an experienced watchmaker or by attending one of the several well known watchmaking schools.

Younger watchmakers or those about to commence in this profession may feel that since watches have become so standardized—such as the friction jeweling, the interchangeability of parts, and other technical improvements in watches—that there is no longer a need for skilled watchmakers.

There is just as great if not greater need for such skilled craftsmen due to the fact that there are still hundreds of thousands of the older types of watches on the market, which require more than a mere knowledge of how to handle tweezers and screwdrivers.

When some of the watches have become obsolete, it is impossible to obtain material for them and it is then necessary to make various parts by hand and do other operations which are not required to be done on the more modern timepieces.

Furthermore, today one finds more complicated watches on the market, such as the various types of stop, chronograph and split-second watches. Work on such type watches requires a high degree of skill due to their intricate mechanism.

A craftsman who can handle this type of work, is looked up to by the rest of his fellow craftsmen and is always assured of getting a very good price for his work due to the very nature of the complexity of the work.

During the last war it was demonstrated that there was a need for skilled watchmakers and repairers in vital defense work. We are now facing a serious crisis in this country and plans are under way to insure a supply of craftsmen in the watchmaking and allied technical industries.

Skilled watchmakers are required to make various timing equipment for altitude meters, airplane and navigation instruments, gun and bomb sights, range and height finders, bomb fuses, and other associated technical military equipment.

A detailed questionnaire pertaining to the qualifications and experience of craftsmen has been prepared and sent out to watchmakers. This questionnaire contains numerous separate phases of watch and clock making, as well as repairs.

Such a registration of craftsmen will provide a complete list of the various skills of the men qualified for government work in the different technical fields as outlined above.

Take the case of the aircraft instruments alone. Technical men with a high degree of skill are needed by the various airline companies, airplane and instrument manufacturers, in order to install, adjust, repair and overhaul the different types of aircraft instruments, such as chronometers, tachometers, altimeters, compasses, etc., which are so vital for safe flying in commercial as well as military aircraft.

I am happy to see the strides that your Association has made during these past years in the various phases of your activities, among them your National Group Educational Program. Such technical lectures and instruction courses given before various guilds are of immense value to the older members as well as the beginners in this profession.

I recommend to young men, who want to learn a trade, to learn to be a watchmaker. It is one trade where a man can always earn a living, no matter where he goes on this globe. That is how there came to be, in

times past, the journeyman with his kit of tools, to repair watches and clocks wherever he went, so he could make a living while he saw the world.

In many trades, during depression times, workers are released without any jobs in sight, whereas a skilled watchmaker can always do repair work at his home.

Remember to strive always to elevate the horological craft. The wise craftsman will practice and improve himself in the science of horology and thereby can explain his work and its merit to his own community. They are naturally the ones who will do the most for him in building up his reputation if the public is thoroughly convinced that he is a skilled craftsman.

You must sell your profession—and it is an ancient and honorable one—the same as the other professional men in your community.

In conclusion I wish to take this opportunity to thank you for being invited to your Convention. My very best wishes for continued success in your various endeavors.

A Lot Of Time

A Washington state firm recevied a $240,000 shipment of watches during July. The firm expects a large demand for watches this summer because of the possibility of defense luxury taxes now under consideration by Congress.

National Circulating Library

Watchmaker members are increasingly seeking knowledge of their scientific profession, and as demands grow so must our Free Circulating Library.

Watchmakers are urged to contribute Horological or mechanical books to this library. Do it now.

SIX BOOKS ADDED

John J. Bowman of the Bowman Technical School presented the Library with the following books:

No. 49 "Electrical Horology" by Langman & Ball.

No. 50 "Electrical Clocks" by F. Hope-Jones.

No. 51 "Workshop Notes" Jewelers Circular.

No. 52 "The Evolution of Automatic Machinery in Watch Mfg." by Edward A. Marsh.

No. 53 "The Jewelery Repairer's Handbook" by John G. Keplinger.

No. 54 Same as above.

Levin & Son of Los Angeles, California have added their most recent book to the National Library, No. 55 Practical Bench Work for Horologist.

Let's help those who seek knowledge. Send in that book today to the National Office in Denver.

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AERONAUTICAL INSTRUMENT SERVICE

Aircraft Instruments

EDITOR'S NOTE—Aeronautical Instrument Service is a subject untouched by publications in the Horological field, or in fact by any publication. In September, 1938, THE AMERICAN HOROLOGIST inaugurated such an educational service via prepared illustrated lectures to be used by U. H. A. A. organizations for the purpose of broadening our members' scope of knowledge in this field, which offered additional remuneration to those far-sighted enough to avail themselves of such knowledge.

ARTICLE No. 23
(Continued from July Issue)

MISCELLANEOUS INSTRUMENTS

Oxygen apparatus. — The purpose of oxygen apparatus is to provide an adequate supply of oxygen to the crew of an aircraft during a high altitude flight. The average person requires oxygen at attitudes above 10,000 feet. If a flight were continued without use of oxygen, a state of unconsciousness would be reached at approximately 25,000 feet. Tests have shown that the limit of consciousness, even when provided with free oxygen, is somewhere near 45,000 feet, because of the low atmospheric pressure. Physiologists differ somewhat concerning the exact amount of oxygen that should be supplied. The standard of oxygen flow as adopted by the Air Corps was recommended by the School of Aviation Medicine at Mitchel Field and checked very closely by tests run at the Air Corps Materiel Division. A double standard was adopted, the smaller amount being oxygen needed for normal flying while the greater amount is sufficient for carrying out maneuvers, swinging a gun or camera, or other exercise which requires an added amount of oxygen. The requirements for oxygen vary greatly with different users and the following standard was adopted as the needs for an average pilot:

Altitude fast	Normal requirement, liters per minute	Exertion requirement, liters per minute	Altitude fast	Normal requirement, liters per minute	Exertion requirement, liters per minute
10,000	2.1	4.5	25,000	7.4	15.1
15,000	3.9	7.7	30,000	10.1	20.2
20,000	5.4	11.0	35,000	13.0	26.0

Gaseous oxygen is suplied in small cylinders about 4 inches in diameter and 18 inches in length. It is compressed to 2,250 pounds per square inch in the cylinder and will expand to 17.7 cubic feet at standard atmospheric pressure. It should be free from dust and dirt and be tasteless, odorless, and, most important of all, it should be dry. Moisture in the gas is likely to freeze and clog the small passages in the regulator, which control the rate of discharge. A purifier which uses phosphoric anhydride as a moisture absorbent has been used successfully by the Air Corps Materiel Division to remove moisture and dirt from the gas while the cylinders are being filled. Pure oxygen gas has also been obtained by the expansion of liquid oxygen in a special expansion chamber.

Liquid oxygen, on account of its continual evaporation, should be used soon after it is produced. It is kept in a vacuum-wall storage container, in which it may be stored for several weeks or transported long distances, allowing, of course, for the usual loss by evaporation. The small containers (respirators or vaporizers) which are used to regulate the evaporation when an altitude flight is being made may be filled at the time of the flight from the storage containers.

Advantages of gaseous oxygen.— Readily produced, stored, shipped, and handled.

Enormous stock supply may be kept.

No waste while not in use.

Flow is easy to regulate.

Disadvantages of gaseous oxygen.—Moisture in gas causes regulation trouble.

Difficult to carry large amount on account of weight of cylinders.

Bullet hazard.

Possibility of regulator failing.

Advantages of liquid oxygen.—Reliability.

Large quantity may be carried.

No danger of moisture freezing in regulator.

Gas tasteless and pure.

Disadvantages of liquid oxygen.—Can not be stored more than a few weeks.

Enemy may destroy source of supply.

Continual loss by evaporation.

Difficult to handle and ship.

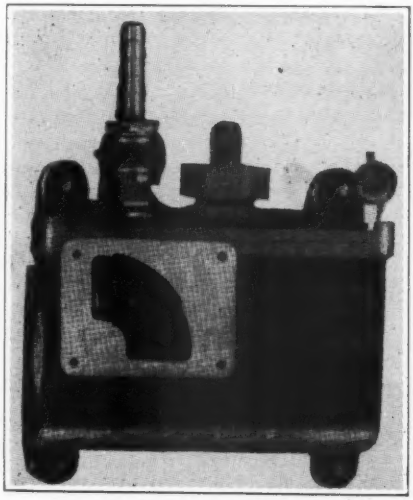

Figure 72—Prouty Oxygen Regulator

Prouty oxygen regulator.—The Prouty oxygen regulator (fig. 72) is automatic in operation. It was originally designed for use by one or two persons and delivered oxygen according to the old Air Corps standard, the flow requirement of which was much less than the present standard. In order to conform to the new standard the Prouty regulator was re-

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worked to give the maximum flow obtainable with the present design. This amounted to about 6 liters of oxygen per minute, using one orifice, and about 11 or 12 liters per minute with both orifices open. As can be seen from the new Air Corps standard this regulator now gives enough oxygen for all purposes for an altitude but little above 20,000 feet, so that they are not recommended for use above 22,000 feet. Using as a 1-man regulator, both orifices are connected into one line by means of a **Y** or **T.**

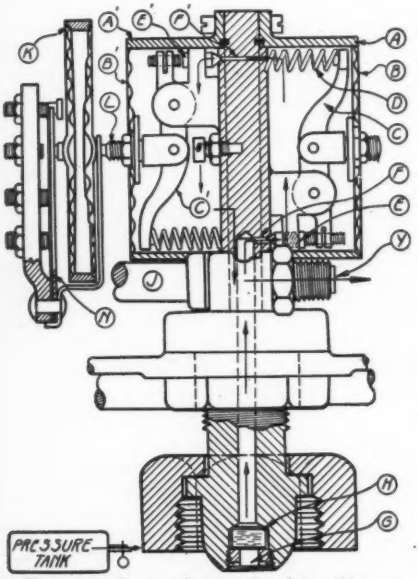

Figure 73—Prouty Oxygen Regulator Diagram

The Prouty regulator is essentially an aneroid-controlled valve. The motion of an aneroid resulting from changes of atmospheric pressure, such as occur on going from one altitude to another, is used to regulate the opening of a valve through which the gaseous oxygen must pass from the supply cylinder to the user. Referring to Figure , the operation of the regulator is as follows: Oxygen enters the screen **H,** which removes dust and dirt. The pressure of the gas is then reduced to 50 pounds per square inch by a high-pressure reducing valve of which orifice **F**, valve stem **E**, chamber **A**, diaphragm **B**, and lever **C** are parts. A further reduction of pressure is obtained by a similar low-pressure reducing valve which is controlled by aneroid **K**. The pressure in valve chamber **A** varies from 0 to 5 pounds per square inch, depending upon the altitude. The oxygen escapes by way of passage **Y** through an orifice (not shown) to the mask of the operator. A second orifice is brought into operation by means of a valve (not shown). Bimetallic spring **N** compensates the regulator against temperature effects. The high-pressure gauge (not shown), consisting of a spiral tube, gear sector, and pinion, indicates to the operator the amount of gas in the supply cylinder.

Installation.—The regulator may be attached directly to the supply cylinder by a special bracket. The cylinder should be so strapped to the body of the aircraft that the pressure gauge is plainly visible to the user and that the instrument is in an upright position. If two or more cylinders of gas are desired for a single flight, a manifold for connecting all the cylinders with the instruments at the same time should be constructed. The manifold should be of one-eighth inch copper tubing, silver-soldered to the necessary ground joint brass unions. The regulator is rigidly attached to the aircraft at some convenient place so that the pressure gauge of the regulator will be plainly visible and the instrument in an upright position.

Operation—The Prouty apparatus is entirely automatic and needs no attention other than seeing that it is properly set before a flight. For normal operation turn the valve on one of the mask connections to the **Shut** position. When more oxygen is required turn the valve on the mask connection to the **Open** position. Open the valve on the oxygen supply

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cylinder and check the pressure indication on the pressure gauge of the regulator just before a flight. Close the cylinder valve immediately after a flight.

Maintenance.— Screen **H,** Figure 73, should be examined and cleaned with a soft brush after each 5 hours' use. A new screen unit should be installed if necessary. After each 25 hours' use, the performance of the instrument should be checked by giving it a laboratory test. Other parts of the mechanism should never be touched. Oil should never be used on any part of the aparatus. The amount of attention which the regulator requires depends largely upon the purity of the gas which is used. Instructions for adjusting the instrument are contained in Engineering Division Test Report No. 1402. An inexperienced person should never attempt to adjust a Prouty oxygen regulator.

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When Is a Watch Properly Cleaned

By HERMAN R. PEDRICK, *Pa.*

A watch is properly cleaned when that watch performs to the satisfaction of the customer. The modern method of cleaning that is done by the majority of watchmakers is not giving the watch a chance to perform as it should.

The watchmaker's standard of cleaning should be more in line with the watch manufacturers. Practical tests find that new watches will keep satisfactory time for one to two years and the public as a whole are satisfied. As soon as the watch needs cleaning which is all the public seems to know when the watch stops or performs poorly, he tells the watchmaker or the jeweler to clean it. We can say a watch needs order, overhauling, cleaning or any other name but the customer wants his watch to keep time, comparable to when it was purchased new. The public is not getting this service from the watchmaker or jeweler today. He is not asking any more from the jeweler and watchmaker than he has experienced with his new watch. Of course, our manufacturers have watches that do not perform properly but they are always willing to make good and usually do. The majority of watchmakers of today are not doing this, or even seem to know how. Therefore there is certainly something wrong with our modern cleaning

methods. Experimenting over a period of years and using cleaning solution purchased on the market plus special solutions made up by individual watchmakers the following was found. That the watchmaker who charges $1.50 for a cleaning and the watchmaker who charges $6.00 there is no difference in performance, for the watches perform well for a period of four to five months always runing slow and then erratic. If any difference the chances are the cheap or $1.50 job may be mishandled although time performance is about the same. This is one of the reasons that we have at the present time, the cheap watchmaker for he has given the public for $1.50 about the same results in watch performance as the so-called better watchmaker or jeweler is giving him, who charges $3.50 to $7.50 or even more—depending upon how much the watchmaker or jeweler thinks he can get, which is based upon previous training and former positions in the jewelry trade. The public is going around in circles trying this watchmaker and that jeweler and finally ending up by deciding that one is as good or as bad as another and he is forced to put up with poor watch performance. The unfairness of this is the jewelers promise that he will put the watch in first-class order, collect the amount quoted, $1.50 up to as much as he thinks he can get and then not doing what was promised.

Countries do not all move their clocks forward an hour to observe daylight saving. In New Zealand for instance, it is advanced only thirty minutes while in several West African colonies it is advanced only twenty minutes.

Antique Watch Display UHAA National Convention

During the National Convention in Duluth we had the pleasure of having one of the finest privately owned collections in America. That of Chas. Arthur (Dad) Tucker. Mr. Tucker's collection commanded great attention and he only had a small portion on display. It is hoped we shall have Dad's complete collection with us in 1942.

Portion of his private display appear in photograph.

Directed by
W. H. SAMELIUS, Chairman
Science of Horology and Technical Advisory Board

Information Please

W.S.J.—Can you give me the particulars to what constitutes a perfectly fitted set of hands?

Answer—On the large circle, the minute hand is the most important and it should reach to the center of the minute circle, so that it will cut the minute marks at the center, when it is over them. The width of the hand should be equal to the width of the minute marks at its outer end. This allows it to be readily seen when the hand is exactly over the minute mark. The second hand should cut the seconds marks in the same manner, in this way it is easy to get an exact registration of the hand, over the minute mark when the second hand is at 60.

The hour hand may be much shorter, but should be long enough to touch the bottoms or inside edge of the hour figures, so that there will be no doubt as to whether they also are in proper position. As to whether the minute marks are made up of dots, finely divided lines or lines connecting inner and outer circle on the minute division, is largely a matter of personal taste. If the hands are properly fitted as described, the shape and width will be found to have a great deal to do with the legibility of the dial; particularly if you are figuring exact time as in railroad usage.

A.B.A.—Recently I have received several watches which required a reduction in the weight of the balance screws in order to bring them to time within the sweep of the regulator. Evidently a rusty hairspring is responsible for this condition, but it would be interesting to know of the many causes that could bring about these errors in vibration. Would be glad to have you answer thru the American Horologist, giving your views fully on this subject.

Answer—A rusty hairspring will go on rusting and the watch will keep changing it's rate. Always change the hairspring if rust is suspected. The weight of the balance should not be changed if it is as it left the factory. Examine it closely and see if somebody has been substituting screws or adding timing washers. Balances out of true or poise will give poor time. So will burred pivots, broken jewels or pitted end stones. Look for dirty or gummy oil in the mainspring barrel, and pivots, especially those covered with cap jewels; also on the pallet and jewel pin and fork slot. Finally, search for an obstruction in the train, bent teeth, bent pivots, or not enough freedom, bristles stuck in the teeth of the wheels rubbing on other moving parts, etc. Oiling too much so it spreads on the hairspring and causes sticking is a frequent cause of poor motion in small watches. You will have to search for the trouble when you get a poor motion. It may be found in any of the above mentioned suggestions.

C.B.—What is the difference between the visible escapement used on American and Brocots pin pallet escapement used on French Clocks?

Answer—They are two names for the same escapement. If well made

and a short pendulum employed, these escapements give very satisfactory results in mantle clocks. The best practice is to use agate or cornelian pallets. In the cheaper clocks, these pallet stones are made of steel. To the workman who does not understand this escapement, he is apt to have trouble inserting the pallets and turning them the wrong way. The flat side of each pallet should point in the direction to the center of the escape wheel. When this is done, the lifts are equal and the drop locks should take place on the thickest side of the rounded surface, that is, the tip of the tooth should drop exactly on the center of the curved surface.

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Northwestern & Southwestern Watchmakers Guilds Hold Picnic

Seventy-five Jewelers and their families attended the Minnesota Jewelers' Picnic held on the shores of beautiful Lake Minnewaska at Glenwood, Minnesota on Sunday, July 20th. The picnic was sponsored by the Northwestern and Southwestern Minnesota Watchmakers' Guild.

All jewelers' brought their own picnic lunch; coffee and ice cream and other refreshments were served free.

During the afternoon and evening, the jewelers and their families were entertained by the Central Minnesota band festival with its fifteen bands which presented a splendid musical program.

The following wholesale jewelers were represented at the picnic and contributed much to the success of the picnic: Kirchner and Reinich of Minneapolis; Ostbye and Anderson, Minneapolis; the C. M. Thomsen, Minneapolis; Enlod Nelson, Minneapolis and the J. M. Bennett Co., Minneapolis.

Mr. E. A. Kirchner of Kirchner and Reinich had charge of special entertainment for the children.

A short business meeting of the Northwestern and Southwestern Watchmakers' Guild was called to order by the picnic chairman, J. N. Jackson of Sauk Centre, Minnesota.

Standing in back row at left: A. M. Hanson, Marshall, President of Southwest Watchmakers Gulid.
Seated back row, left to right: James Marcotte, Marshall, Secretary Southwest Watchmakers Guild; Joe Jackson, Sauk Centre, Picnic chairman; Jos. W. Felix, Fergus Falls, President, Northwest Watchmakers Guild.
Front row, left to right: W. A. Welander, Fergus Falls, Secretary of Northwest Watchmakers Guild; Carl Berger, Tracey, Minnesota; Fred Ohlsen, Marshall, Minnesota.

It was decided that two joint picnics of the Southwestern and Northwestern Watchmakers' Guild be held each year—one in the northern part of Minnesota, and one in the southern section of the state.

Los Angeles July Meeting

Although the scheduled speaker of the evening, Lieutenant Hilton of the U. S. Navy failed to appear, Chris. Wagner, one of our members, followed the opening business of the meeting and gave a very interesting talk on measuring tools and their uses. Mr. Wagner brought along a number of his instruments and described their use in different problems that he has encountered in his wide experience as a Horologist and instrument maker.

Mr. John Nooyen the Chairman of the Los Angeles Guild is planning a motor tour through the East during August and September and during his absence Mr. A. E. Palmer, Vice-chairman will preside over the meetings.

A series of very interesting meetings have been planned for the coming months and it will pay members to set aside the third Wednesday evening of each month and attend the meetings regularly.

R. B. Schorsch, Sec'y.

Tennessee Changes Annual Meeting

The Tennessee Watchmakers and Jewelers Associations are cancelling their seventh annual convention, previously scheduled for Chattanooga, Tennessee, August 31 and September 1, due to unforseen complications.

All members and officers throughout the state are herewith notified that a state board meeting will be held, and all members throughout the state are invited to attend. This will be held at Nashville, October 5, in the Noel Hotel.

Tennessee is planning bigger and better things for the ensuing year. New officers will be elected at this meeting.

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Nation's Oldest Watchmaker Dies

Frank Wesley Merriam, 93, of Fremont, Ohio, reputedly the oldest active watch-maker in the country, died at the Sunset Convalescent Home here July 19.

For many years in business in Fremont, first with L. G. Hamilton and later by himself. Mr. Merriam was born in Brookfield, Ohio, November 9, 1847. He started to learn the watch-makers' trade in Warren in 1869 with Elias Hull and was married to Miss Jennie Hull in 1886. They came to Fremont shortly after and always made their home here.

He was thorough and imbibed everything to be learned about his chosen trade and was recognized as an expert. He was of the old school that believed in sticking to one's job. He never retired and until death was only a few weeks away was he missed from his usual headquarters.

He was a member of the I. O. O. F. lodge for 72 years. Surviving are two sons, Frank H. Merriam of Fremont and Phil D. Merriam of Lorain, Ohio.

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Shoyei Yamauchi	Peoria, Ill.
Students at Bradley Polytechnic Institute	

R. E. Gould, Secretary

Short Repair Methods

From time to time there will appear articles by Jes. I. Hansen, under the title of "Short Methods in Every Day Watch and Clock Repairing".

It is hoped the reader will take them for their worth and not for criticism. In these articles, he will make no attempt to varnish a picket fense, but give every time keeper its just dues. In other words, give a high-grade time keeper the best there is in you, but don't spend a lot of time on a cheap time keeper, and let the customer understand he gets no more than he pays for.

S. Geo. Cochron Enlarges Business

Mr. S. Geo. Cochron, state president of the Tennessee Association, now has a partner, Mr. Max Sexton, formerly with Bush-Borruk.

The shop has been completely modernized so they have an up to date watch shop to serve the public. They will also teach watchmaking, and they now have two students.

Guild No. 1 will hold its monthly meeting in August, as guests of Mr. Cochron and Mr. Sexton.

New Majestic Unbreakable Watch Crystals

Almo Sales Company, New York City, will send upon request samples of their Majestic Unbreakable Watch Crystals. The new material of these crystals is equal to any unbreakable crystals that can be obtained at any price. They are of the new non-inflamable material.

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Colorful Elgin Portfolio Presents The Opportunity At Hand For Retail Jewelers

"All America Is In The Money!" is the intriguing title of a presentation now being made by salesmen of the Elgin National Watch Company and by Elgin wholesalers' salesmen to retail jewelers.

Everywhere, according to this Elgin presentation, there is now news of more jobs, more income, and more dollars for people of average means to spend. It is shown that employment is now at a record high due to the billions for defense and the demand for consumer goods. That the national income is expected to top the 82 billion mark of 1929. And that the average of 16 million employed industrial workers show an estimated $26.73 a month above expenses available for additional buying.

Thus, with some 11 billions of dollars estimated to be what Americans will have for extra spending this year, Elgin believes jewelers can expect the largest business since 1929.

Th fact that Elgin's sales and deliveries during the first four months of 1941 have been the largest in its 77 year history is proof of this growing demand, says Howard D. Schaeffer, vice-president.

And to help jewelers bid for an even larger share of America's extra dollars, says Mr. Schaeffer, Elgin has produced a complete line of new timepieces for 1941-1942.

Reflecting Elgin's traditional leadership in style and value, these handsome new 1942 Elgins are now being presented to the trade in the brilliant 1942 Elgin catalog. They include many distinctive new features, and each contains a famous, star-timed Elgin movement.

Plans are also announced in the Elgin presentation for heavy Fall advertising campaigns to help jewelers capitalize fully on the demand for these fine timepieces. America's best-read magazines such as Saturday Evening Post, Life, Collier's, Liberty, True Story, Time, Newsweek and The American Weekly will carry the

---

Elgin Employees Share Largest Wage Bonus in Company's History

On May 31 twenty-five hundred employees of Elgin National Watch Company who had qualified by at least six months regular employment with Elgin were paid $155,565.91 in bonus wages, it was announced by John M. Biggins, Secretary-treasurer of the company.

This wage bonus, Mr. Biggins pointed out, is the first payment of the total bonus based on Elgin's 1940 earnings. The second half of the 1940 bonus will be paid to qualified employees in December, shortly before Christmas. Elgin's total 1940 wage bonus will amount to considerably more than has ever been distributed by Elgin in any one previous year.

The amount of the Elgin wage bonus each year is based directly on company profits. In the case of the present bonus, payments represent 9.7 per cent of the annual earnings of the eligible employees which means that more than a month's extra wages will be paid to these employees.

According to Mr. Biggins, the grand total of wage bonus payments made to Elgin employees since the Bonus Plan was inaugurated in 1936 now exceeds three-quarters of a million dollars.

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All "Special Notices" are payable in advance. Forms close on the 25th of the month.

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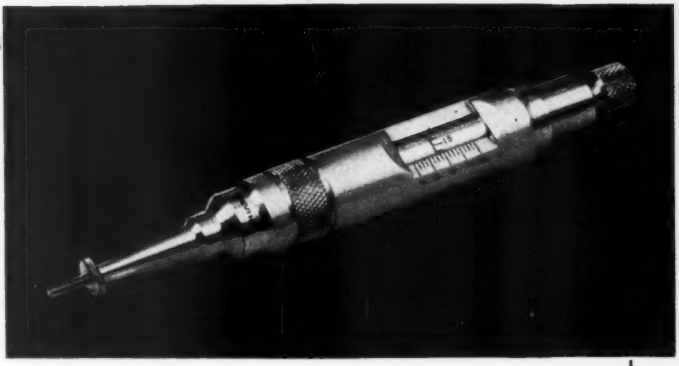

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